FAA Aviation NEWS

JULY-AUGUST 1987

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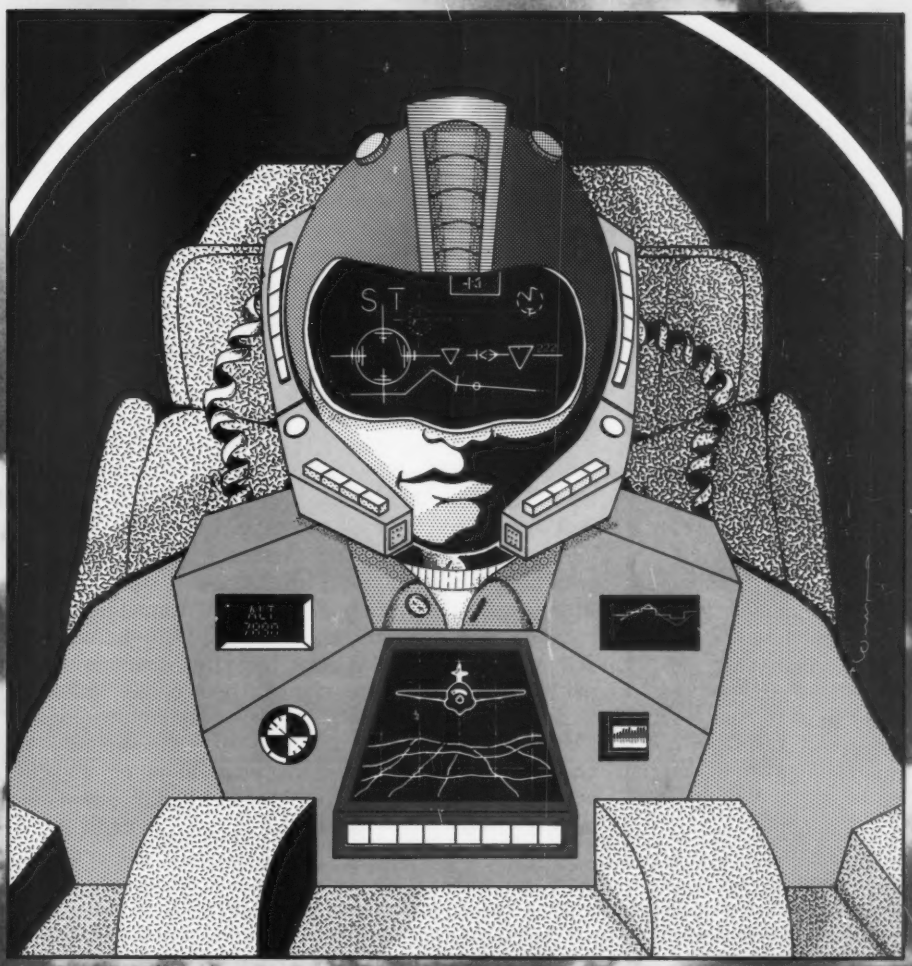

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BRIEFS

MOVING 'EM OUT. Helicopters may have replaced cutting horses for herding cattle on some modern ranges, but not all livestock have adjusted to this type of handling. In one recent accident an irritable cow was being driven back to the herd by a pilot in a Hughes 269C at low hover when suddenly the cow spun around, reared up and hooked its horn on a skid. The helicopter pitched forward and struck the ground, causing substantial damage to the helicopter. The pilot was not injured; the cow disappeared.

DANGEROUS DEVIATIONS. Modifying even small components of amateur-built kit aircraft (Experimental) could have serious consequences when the builder is not qualified to evaluate the design. A fatal accident occurred on the second flight of a newly completed homebuilt when the canopy opened and shattered during the approach to land, leading to loss of control. The pilot-builder had designed and installed his own version of a canopy latch, which proved to be overly sensitive to vibration. Any such intended changes should be discussed with a qualified aeronautical engineer.

AG ENCOUNTERS. Agricultural applicators, balloonists, ultralight, flyers and others who like to operate in the early morning hours at low altitude should be aware of possible low level military activity in their flying area. VFR military training routes are depicted on sectional charts as light gray lines. Training missions along such routes are carried out by camouflaged jet fighters traveling at speeds up to 400 knots and sometimes hugging the terrain—very difficult to see or avoid, and their wake turbulence alone could spell disaster for a light aircraft maneuvering close to the ground. If there are such routes in your area of flight, be sure to check with the local flight service station for scheduled time periods of intended military use. (This information may not be routinely supplied in a briefing, but is available upon request.)

"HOT" IRON. Pilots flying over the Florida Keys should be careful to avoid restricted area R-2916, 14 miles NE of Key West. Four miles in diameter and extending up to 14,000 MSL, this restricted area is in continuous use by a tethered helium airship (about the size of the Goodyear blimp) containing radar equipment. The airship has strobe lighting but the steal cable is not marked or lighted. Aircraft have been observed flying within 500 feet of the cable.

An Editorial from the Long Beach, CA, Press-Telegram

Passenger Safety in Small Aircraft

Even taking into consideration the heavy private plane traffic in the skies here in southern California, there are too many fatal crashes every year. And too often the dead are innocent passengers who have placed their lives in the hands of a pilot who, inexplicably, misjudges the weather.

Four private plane crashes killed nine persons here over a recent weekend. Some of the pilots in those crashes were undoubtedly skilled and experiences, and it is not at all certain just how much pilot error was to blame in any of the crashes. Undoubtedly bad weather was a factor. But it was not that the weather was unusually turbulent. It simply was the kind of weather that shrouded mountaintops and obscured landmarks, making flying difficult.

In one case, the pilot of a plane with two couples and a child apparently flew into a mountainside in the Angeles National Forest.

Two Glendale brothers, 25 and 31, were in a rented plane that crashed near Big Tujunga Canyon Road above La Cresenta.

The executive officer of the 1,800 member Naval Air Reserve unit at Point Magu Naval Air Station in Ventura County smashed his single-engine private plane to the ground along Old Highway 395 near the San Diego County community of Rainbow on the way home from the Navy base.

And a Sierra Madre veterinarian became lost flying from El Monte to Sana Ynez, and was killed when his plane's wings and propeller were sheered off by a grove of eucalyptus trees.

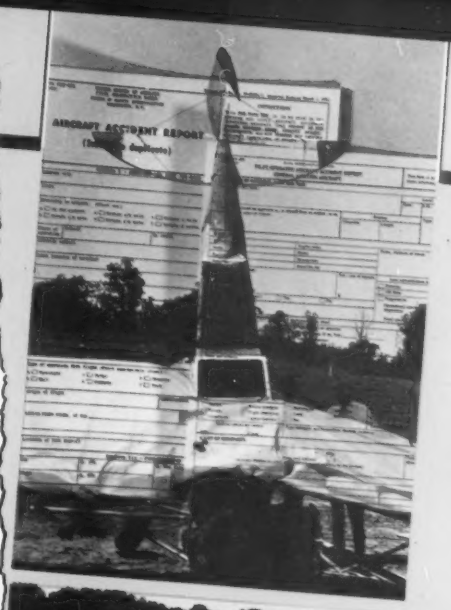
When pilot error costs the life of a pilot, that's a tragedy. When it cost lives where others have taken the step, too often lightly considered, of putting themselves or their children in another's hands, the result is something more that tragedy. It is an avoidable disaster.

The Federal Aviation Administration conducts an intensive, continuous program to encourage private pilots to use judgement. It hold frequent seminars on safety and it designates volunteer counselors to watch out for, talk to, and, if necessary, report pilots who do not observe good flying habits, whether their laxness involves inappropriate behavior in traffic or a lack of consideration for the weather.

Nonetheless, FAA experts on private aircraft safety say there is little they can do to control the behavior of the normally skilled and trustworthy pilot who, for some unexplained reason, decides to challenge the weather.

The best recourse an individual passenger has when he or she is asked to take a flight that might be subject to such an error in judgement is to question the credentials of the pilot. Ask if he or she is instrument-rated. How recently has the pilot been checked out on instruments? How often does the pilot fly under what circumstances?

Such questions may make the pilot momentarily uncomfortable. But they can save your life, or the life of a person close to you.



The accompanying newspaper editorial, although written several years ago, is still applicable for all passengers traveling in private aircraft, especially in the heavily trafficked airspace around our larger cities. We who work at FAA believe that our safety standards for airmen and aircraft are the best in the world. But we must acknowledge that in a country like ours with over half a million private pilots, who fly because they love it but earn their daily living otherwise, there is an opportunity for mistakes to occur. Modern flying is largely an exercise in coping with the hundreds of details that require attention in preparing for a safe flight.

The passengers of private pilots are in an ideal position to pick up on preparatory errors, neglected problems and, sometimes, decisions that involve undue risk. To do so they need a rudimentary knowledge of the approved procedures for carrying out a flight in a private aircraft. Lengthy experience does not guarantee that a pilot will not occasionally miss an item of the checklist, or press on despite below-minimum weather.

Some passengers feel embarrassed about asking their pilot concerned questions about the flight, not wishing to appear mistrustful. But there is no real basis for such reluctance. Pilots who have nothing to hide are self-confident and proud to exhibit the certificates which show the airman privileges they have earned. They usually enjoy explaining to the uninitiated the means they are taking to ensure flight safety. Pilots who lack confidence or are hiding something are not worthy of a passenger's trust. Oddly enough, some pilots feel embarrassed about discontinuing a flight or altering a destination, out of fear of being judged cowardly or incompetent, when in fact the decision is a good one.

The following page contains a brief summary of flight background information for non-pilots traveling in private aircraft. We recommend that pilots make it available in some convenient form to their passengers and take time to answer questions as fully as possible. We also recommend that passengers take the trouble to study this information, to observe flight preparations, and to ask questions freely—in an appropriate manner, of course, which does not interfere with the performance of pilot duties.

→

BASIC KNOWLEDGE ABOUT FLIGHT PREPARATION FOR PRIVATE AIRCRAFT PASSENGERS

Note: This is not intended to encompass all of the steps a pilot might wish to take in preparation for a safe flight, or to spell out the pertinent regulations. Such a listing would require many more pages and vary according to the flight conditions, type or aircraft and purpose of the flight. This information is meant simply as an eye-opener for passengers who would like some basic understanding of what qualifications the pilot is expected to have, and some of the tasks he will normally do during the preparatory stages of a flight.

CERTIFICATION

1. *Pilot Status.* The minimum level of pilot certificate required to legally carry passengers, is a "Private Pilot." A "Student Pilot" is not eligible to do so.
2. *Ratings, qualifications.* The pilot will be rated for one or several or all of the following: single, multi-engine; land or sea; fixed wing or rotorcraft; glider or lighter-than-air. The certificate may also bear an "Instrument rating," the validity of which is tied to recency of instrument experience.
3. *Medical qualifications.* The pilot must have an FAA aviation medical certificate dated within the past two years. This certificate may carry some limitations or restrictions, i.e. "Corrective Glasses must be worn," etc.

FLIGHT CURRENCY

Pilots are required to keep a written record of official endorsements or flight experience, the currency of which may affect their operating privileges. This is usually entered in a "Pilot's Logbook."

1. *Biennial Flight Review.* The "BFR" must be completed every 24 months and signed off for the record by a appropriately certificated flight instructor, in order for an airman to act as pilot in command.
2. In order to *carry passengers* legally the pilot in command's record must show that at least three takeoffs and landings, as sole manipulator of the controls, have been performed within the preceding 90 days.
3. *Night flights.* The pilot must have completed and logged at least three full-stop landings at night within the past 90 days, in order to carry passengers at night.

FLIGHT PLANNING

1. *Weather Information.* What the pilot needs to know, minimally, is the observed local weather and the forecast en route and destination weather. This is obtained by telephone or by visiting an FAA flight service station. A basic determination must be made as

to whether the flight may be carried out according to visual flight rules (VFR) or instrument flight rules (IFR)—the latter requires a current instrument rating and an appropriately equipped aircraft.

2. *Navigation.* Under VFR the pilot may navigate either by visual reference to the ground or by following a course established by radio signals from FAA transmitters. Under IFR navigation is accomplished by reference to radio signals along a course and by means of controller-issued instructions.
3. Only *IFR flight plans* are required. However, VFR flight plans are recommended for cross country flying as a measure of increased safety, since these will greatly assist rescue efforts in the event of an emergency landing.

PREFLIGHTING THE AIRCRAFT

Private pilots are required to take all reasonable precautions to ascertain the airworthiness of an aircraft. This includes a "walk-around" hand and eye examination of visible and readily accessible components. An aircraft may not operate legally if any components are inoperative. Preflight checklists are utilized containing such items as:

1. *Fuel content and quality* (a major factor in accidents). Light plane fuel gauges are only accurate when they read "EMPTY"! Pilots normally inspect the fuel filler openings visually and drain several ounces of fuel into a container, to make certain fuel is of the correct type and grade (as indicated by color) and free of water or other contaminants.
2. *Engine oil.*
3. Free movement of *control surfaces* (ailerons, elevator, rudder).
4. *Damaged "skin" areas, propeller blades, lights, leaking fluid.*
5. *Landing gear, tires.*
6. *Cleanliness of windows-no bugs!* (important for seeing and avoiding other aircraft, which may first appear as small dots).

COCKPIT AND CABIN AREA.

Availability of appropriate paperwork, such as airworthiness and registration certificates.

Just prior to start-up the pilot may refer to a manufacturer—provided check-list of sequenced operations. This is not a sign of inexperience, rather it is good operating procedure. The pilot should also ascertain that all seatbelts or safety harnesses are properly fastened and that the cabin doors are securely closed and latched. Brief instructions on emergency procedures may be given. ■

KEEPING YOUR PLUGS CLEAN

Engine failure or misfiring as a result of fouled spark plugs has been an ongoing problem for users of piston-driven engines ever since they were invented. Modern pilots are still plagued with plug trouble despite all the improvements that have taken place in the aircraft engine and the availability of so-called non-fouling plugs with extended tips. Some aircraft seem more prone to plug fouling than others, but the problem is so widespread in general aviation that the finger of responsibility would appear to point toward the person in the lefthand seat.

In a word, plug problems are largely due to *engine mismanagement.*

We have to remember that a great many light aircraft are now obliged to use fuel with a higher octane content than the engines were designed for. In Avgas this higher octane rating is obtained with the use of lead tetra-ethyl—which means more lead in the combustion chamber. The 100 LL octane fuel you are using in place of the 80–87 octane you can no longer get may be designated low lead (LL) but it still has about twice as much lead as 80/87 octane.

It is true that modern Avgas has a lead scavenging agent which is expected to keep the nose of the plug clean, but this device only works when the spark plug core temperature is at least 800° F. To achieve this temperature your engine has to be operating with a minimum of 1,200 rpm.

That number is worth remembering. If you are in the habit of idling the engine on the ground at a slower rpm to save fuel costs, consider that new plugs for a four cylinder engine will cost over $100 plus installation. True, you could install them yourself, or even just clean them, but that takes time and patience, as well as access to a calibrated torque wrench and appropriate torque valves, in order to replace the plugs legally and correctly.

Incidentally, if you do perform your own spark plug replacement, do not simply order a set identical to the old plugs. One reason the old ones may not be doing so well could be the fact that someone made a mistake. Always check with the maintenance manual specifications for your aircraft when you obtain new parts.

Some aircraft operations, such as approaches to land, or taxiing on busy airfields, have to be done at low rpm, of course. But with a little planning you can avoid or minimize prolonged engine cooling.

Apart from insufficient rpm, the most prevalent cause of plug fouling is an overly rich fuel mixture. Typically this happens when you are idling the engine while waiting for takeoff clearance, with the mixture already at full rich. It can also happen if the engine is flooded during startup. In the latter case, slowly run the engine up to high rpm to burn off harmful deposits, and then return the engine to normal power.

A Lycoming Company's Service Letter offers the following additional recommendations:

- Use normal recommended leaning techniques during cruise, regardless of altitude, and re-lean the mixture if carburetor heat or alternator air is selected. Flight training schools aircraft should not, if possible, be used exclusively for flying in the airport pattern, where the mixture almost invariably will be full rich. Try to schedule all aircraft for a share of cross-country flight.
- If possible (and in line with good airmanship) try to avoid power-off landing approaches, as carburetors and fuel injectors are set slightly or the rich side at closed throttle.
- Keep engine operating temperature in the normal range. Some pilots have the mistaken idea that the lower the cylinder temperature the better it is for the engine. Normal power settings, proper leaning and correct use of cowl flaps will enable you to keep the temperature in the cylinder head in the normal range.
- Before shutdown, following either flight or ground operations, go to 1,800 rpm for 15–20 seconds, reduce to 1,200 rpm, and then shut the engine down immediately, using the mixture control. This advice applies only to aircraft with engines designed for fuel containing less lead than is now available. In other circumstances follow the procedure for shutdown given in the Pilot's Operating Handbook.
- Particularly significant. Swap top and bottom spark plugs every 25 to 50 hours, as the top plugs scavenge better than the bottom. ■

THE RIGHT SEAT

Question: *In a vertical impact type of accident, airplane or rotorcraft, which type of seat cover would be more likely to contribute to a serious injury—one with a thick cushion, or a thin cushion?*

That's right, the *thick* cushion. A lot of people who fly have trouble accepting this idea, since it seems counter to daily experience in the placement of the posterior. We associate thick foamy cushions with comfort and ease, to the extent that some of us replace the original equipment cushions in our aircraft with softer, thicker ones. However there is mounting evidence that this practice is increasing the number and extent of spinal injuries, especially in accidents involving gliders and other non-standard light aircraft.

Vertical impact accidents usually involve deceleration of short duration, frequently lasting less than 1.0 seconds, sometimes less than 0.1 seconds. (Deceleration is, technically, any negative change in velocity, but the term is also used here to mean a reduction in velocity to zero.) What is of prime importance for survivability in this type of deceleration is the velocity change. For someone restrained in a seat, the limit of tolerance is about 50 "G"s. This is the peak force that would be produced by a velocity change of 80 ft/sec over 0.05 seconds.

What kinds of accidents produce significant vertical deceleration like this? Stalls and incipient spins, sometimes, but also any type of accident involving a high sink rate into open terrain. Fifty "G"s would be considered a maximum tolerable force for human beings, except for a factor known as a "dynamic overshoot."

Dynamic Overshoot

To understand this phenomenon you must bear in mind that in a vertical impact accident all parts of the aircraft, including occupants, decelerate from a given velocity to zero. However, not all of the parts of the aircraft (including occupants) decelerate in the same manner.

A body seated on a large, soft cushion, for example, would experience, on impact, a momentary *acceleration*—so that the ultimate arresting force could be higher than 50 "G"s.

This force could be further increased by failure of the seat support structure—which could, again, induce momentary acceleration of the occupant.

Of course, if the seat were affixed to the cockpit floor with sufficient strength, then both floor and seat would decelerate together and experience identical "G" force. (Some newer designs of cockpit floor and seat go further in the direction of crashworthiness and attempt to elongate the deceleration, so that the occupants experience less of a deceleration rate than the aircraft. Some manufacturers are already producing this equipment.)

However, significant dynamic overshoot—and injury—may still occur if the aircraft owner replaces the standard seat cushions provided in the aircraft with a softer cushion of his own choosing. Foam rubber cushions in particular are notorious for not only causing body acceleration in an accident but also for producing a "rebound" effect that increases the effective "G" forces experienced by the seat occupant.

"Submarining"

Compression of the seat cushion could also bring about the phenomenon known as "submarining." As the body sinks, the lap strap moves relatively higher. The loosened shoulder straps now allow the body to more forward, thus raising the lap strap even higher. Forward restraint may now be negligible, and the body "submarines" out underneath the lap strap. Apart from what injuries may be suffered by the unrestrained body, the lap strap itself may now do serious—often fatal—damage to the liver and spleen by moving up hard against the bottom of the rib cage. Bleeding from liver and spleen injuries is usually fast and impossible to stop by first aid measures.

In summary, the three serious problems with foam seat cushions are.

- You may compress the cushion in a manner that increases the "G" force during impact.
- You may "rebound" and experience even higher peak "G" forces.
- Your seat strap may loosen, causing other types of injuries.

Which Cushion is Best?

Whether foam or not, the three main qualities of the seat cushion that can affect your safety in an accident or hard landings are *thickness, hardness,* and *resilience.*

Increased **thickness**, or depth, of the cushion will allow you to accelerate briefly (after the aircraft impact) while compressing it. This will increase your velocity and ultimately result in a higher peak deceleration. *Thinner cushions are better than thicker ones.* (The exception would be a thick but relatively hard or solid cushion—see below.)

Hardness—or softness—will have a direct effect on how much and how fast you compress the cushion material, and thus how much dynamic overshoot you risk. *The harder the substance, the less compressible it is and the better suited it is for a safe aircraft seat cushion.* Softer seat cushions are more comfortable, true, but paradoxically very soft ones are safer than just soft ones. This is true if they are so soft that most of the compression takes place as soon as you sit on them. In effect, the very soft cushion equates to a hard and thin cushion, as far as accident impact force is concerned.

How soft is very soft? If the cushion compresses to no more than ⅛th of its thickness as soon as you sit on it, then it is very soft. Very hard or very soft cushions are best.

Resilience is the property of bouncing back. Quite simply, seat material should not be resilient. In other words, the materials should be energy-absorbing but not energy-storing. The worst examples of the later are cushions made of rubber or similar materials and those of thick medium density foam.

Energy-Absorbing Cushions

There are, however, recently developed polyurethane foams that are energy-absorbing, and which also make comfortable seat cushions. Known variously as rate-dependent, high hysteresis, or slow-recovery foams, these open-cell foams are unusually sensitive to temperature and pressure. Under conditions of sustained loading and increased temperature (i.e., when sat upon), they exhibit a multi-directional creep and conform to the indenting body over the entire contact area, establishing a relatively uniform contact pressure and this a high degree of comfort.

During an aircraft crash, these unique open-cell polyurethane foams behave like much stiffer materials, minimizing the dynamic overshoot. The properties of the foam that are responsible for this behaviour also cause the foam to recover its height slowly following impact. Thus less energy is imparted to the seat occupant during recoil than would be expected with conventional polyurethane foams.

There is a possible disadvantage to using these "open cells" foams in that they may deteriorate more quickly than other materials, especially with the high interior temperatures experienced by aircraft parked in the sun. ■

Editor's Note: This article was adopted in large part from the December 1986 issue of New Zealand FLIGHT SAFETY, with kind permission of the Ministry of Transport.

New High Altitude Charts

Pilots who use the high altitude routes that begin at 18,000 feet MSL will be pleased to know that the long awaited revision of FAA's IFR En Route High Altitude chart series has been completed. The new version for Alaska becomes effective on September 24, 1987, and for the 48 adjacent states on November 21. The Defense Mapping Agency high altitude charts which serve Hawaii are expected to adapt to the new FAA format in the near future.

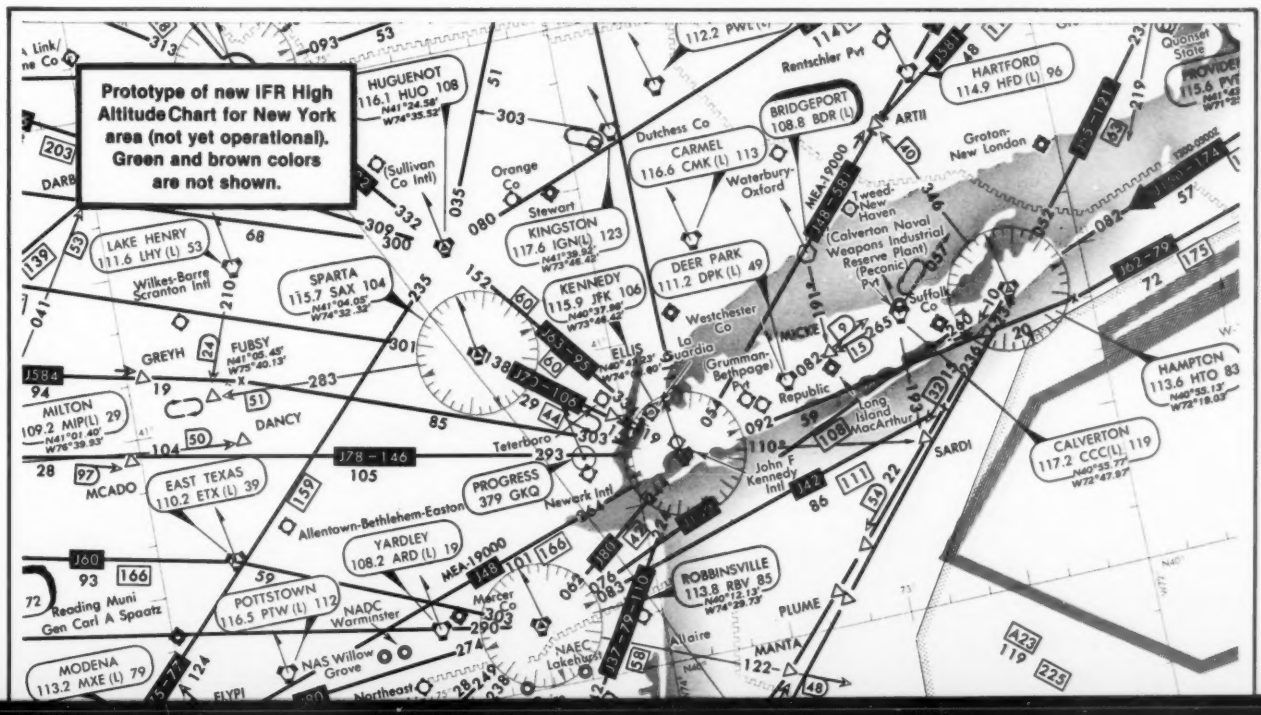
The new formats represent comments and suggestions from airspace users initiated during the National Airspace Review in 1982, when problems of readability, especially in highly trafficked areas, were cited by many pilots. The increase in parallel traffic airways which took place in February of this year, as part of the East Coast Plan for more efficient traffic flow, added to chart congestion. In fact, in order to introduce the new East Coast route structure it was necessary to publish a special supplement to the "H-6" chart.

The new charts include a reconfiguration of symbols and colors as well as an improved depiction of routes and an expansion of scale. The four charts for the 48 adjacent states are being replaced by six charts, with a scale almost 25 percent greater. The new chart for the eastern seaboard (H-6) will include a specially expanded "strip" section on a scale of 1" to 18 NM, thus eliminating the need for the present East Coast "H–3" supplement.

Greater legibility is achieved not only by improved typography but also by better color use and contrast. Black is used for jet routes and associated route designators; brown is used for oceanic and other special routes. Blue will be used to show special use airspace, air route traffic control center boundaries, and airports with approaches described in DOD FLIP publications. A fourth color, green, has been added to depict shorelines and airports with civilian instrument approach procedures.

The prototype of the new charts, shown on this page, has been tested operationally by military pilots, with enthusiastic approval for its overall ease of use and readability. The finalized charts will be shipped to chart sales agents or directly to subscribers approximately one week in advance of the effective use date. They are published by the National Ocean Service (NOS) and may be obtained from the NOS Distribution Branch, (N/CG33), Riverdale, MD 20737.

Work is under way to revise the Low Altitude Enroute Series as well as on the Sectional, Terminal Area and Instrument Approach Procedures Charts. Opportunities for public comment on these revisions will be reported as they become available. ■



ELECTRICAL POWER LOSS

Battery Reserve and Emergency Loads

The pilot was on a 100 mile cross-country flight on a clear, starlit night in a Cessna 182 when he became aware that both the external and internal lights seemed to be getting dim. He blinked several times, to make sure his eyes were not betraying him, and then reached for the emergency procedures section of his Pilot's Operating Handbook, which was brief and to the point "... when an alternator failure occurs in flight, all non-essential electrical load should be discontinued to conserve the battery life." As the pilot attempted to separate, mentally, the essential load sources from the non-essential, while fumbling for the flashlight he was certain he had stashed somewhere in the cockpit, the lights continued to fade and quite soon he was swallowed up in a virtual sea of darkness.

A pilot's nightmare—how could it happen? Easily enough. A loose alternator drive belt, resulting in a partially discharged battery, which became fully discharged when the belt failed in flight.

Preventable? Yes, if the pilot monitors his ammeter faithfully—and if he understands the limitations of a battery that is not receiving a normal generator or alternator charge. And—if he is prepared to relieve the battery of non-essential power drainage quickly.

What constitutes non-essential electrical power in an aircraft with only one charging system (this includes some light twins) varies from one aircraft to another, and from one situation to another. To be realistically prepared for the various possible scenarios, it would be helpful to work out suitable procedures in advance, when the aircraft is sitting quietly on the ground. Pilots who are not prepared for such emergencies often get so carried away in dealing with it that they neglect other cockpit duties, such as proper fuel selection, response to light signals, etc., which compounds the problem of landing safely.

The least serious scenario would be loss of the alternator during a daytime VFR flight in a fixed-gear aircraft in uncontrolled airspace over open or level terrain. In these circumstances you could shut off virtually all electrical systems (including auto-pilot, panel lights, navigation lights, radios and transponder) and land at the nearest airport or suitable field, conserving battery power for emergency needs and for landings. If necessary for navigation you could retain the NAV radio. If your turn and bank indicator is electrical only, you might want to shut that down with the circuit breaker until you are ready to land.

Hopefully you would be able to conserve enough battery power to extend flaps and to radio an airport controlling facility, but in this case neither of these requirements is critical. In a landing pattern you could extend your downwind leg far enough to approach without flaps, and if the airport has an active tower you would follow the no-radio approach procedures described in the Airman's Information Manual.

The worst possible electrical failure scenario would be single pilot IFR at night in a retractable gear aircraft. The normal electrical demand in these conditions could be double the amperage hour capacity of the battery. For example, in a night IFR operation the normal continuous electrical demand might be as high as 40 amps, which is well within the range of the customary alternator output. However once the generator or alternator goes off the line, for whatever reason, your electrical source in a typical single engine aircraft is a battery probably in the range of about 25 amp hours.

Battery Mathematics

This would seem to indicate that you could draw 25 amps from the battery for one hour, or 40 amps for about 40 minutes, but this is not how battery mathematics works. With batteries, the higher the amperage load, the less the usable total amperage. Thus a 25 amp hour battery could produce 5 amps per hour for 5 hours, but if the load were stepped up to 10 amps it might last only 2 hours. A 40 amp load might dischargaf01e the battery fully in about 10 or 15 minutes. Hence the importance of going quickly to an emergency load when the generating source fails.

Furthermore, the battery's condition of charge will depend upon such factors as the time elapsed since takeoff, the ease of difficulty of engine startup, and the duration of the pre-takeoff operation. Generators, for example, will not produce usable electrical current at low rpm, and some alternators will not provide more than about 50 percent of their rated output at 1,000 rpm.

Some pilots are under the impression that the high rpm settings for takeoff and climbout will restore a full charge to the battery almost immediately, but this is not the case. Aircraft batteries differ from car batteries principally in that they are of lighter construction, with thinner plates spaced closer together. For this reason they are easily ruined by the application of a very high charge rate, which the aircraft system is designed to prevent. Normally it would require at least an hour of flight time at cruise to restore a battery to full charge after startup and takeoff—longer at night. The condition of the battery is an important contributor to this charging

Remember that, despite its other advantages, the alternator, unlike the generator, will not recharge a completely depleted battery (alternators need a live battery to excite the field circuit). Unless your aircraft has an ammeter which shows battery charge and discharge rates (and you monitor it frequently and with understanding), you could run down a partially discharged battery during the engine startup and set out on your flight with a weak or useless battery. This is hazardous, and prohibited by the regulations.

Note that battery ammeters in aircraft tell you nothing about the state of charge of battery—only the approximate *rate* of charge or discharge. With the needle pointing at zero the battery might be fully charged or fully discharged. When the system is functioning normally you should see the needle dip deeply into discharge during engine startup, show a strong charge rate during takeoff and in-

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dicate a slight charge or remain centered during cruise. A discharge reading at cruise means there is a malfunction in the charging system, and a weakening battery.

In aircraft of more recent vintage you are likely to see a charge ammeter, or loadmeter, instead of a battery ammeter. This type of meter tells you nothing directly about the battery, only the approximate load from electrical components to which the generator/alternator is responding. In flight the loadmeter needle should move progressively up the scale as you turn on components, and descend as you turn them off. If the needle does not respond to load inputs, or descends without your shutting off electrical equipment, you have a failure in the charging system (or in the ammeter itself) and the battery may be supplying all electrical power.

The common causes of charging system failure are weak (non-chargeable) batteries, loose drive belts, worn brushes, or loose wires and shorted circuits. In the latter case the alternator/generator circuit breaker will usually pop out. Occasionally this also happens as a result of an electrical surge and the circuit breaker may be reset after the circuit has had a few minutes to cool off. If it pops out again, the alternator/generator system should be switched off, to prevent a fire in the engine compartment (see example below).

What constitutes an "emergency load" following an alternator failure can not be predetermined, because the actual circumstances will always be somewhat different: VFR or IFR, night or daytime, in clouds or in the clear, over land or sea or mountains, distance to nearest airport, nature of the electrical problem, type of airspace being traversed, etc. Regardless of the circumstances the two key factors will be the power needed to control the aircraft and to navigate.

For example, some electrical failures in flight involve the shorting out of wires and could result in an inflight fire. Here the dominant need may be to land immediately, and whatever power is available should be directed toward that effort, including landing lights and landing gear extension, if necessary and available. Recently the pilot of a tailwheel Bellanca was conducting an aerial observation near Selz, ND when he experienced a generator failure. Soon afterwards he smelled something burning and noticed smoke coming out of the engine compartment. He descended immediately, made an emergency landing on a dirt road and hastily evacuated the airplane. Two minutes later both fuel tanks blew up. The subsequent investigation indicated that the fire had originated in the area of the alternator.

Electrical loads for light single	Number of units	Total amperes
A. *Continuous Load*		
Pitot Heat (Operating)	1	3.30
Wing Tip Lights	4	3.00
Heater Ignitor	1	1–20
**Navigation Receivers	1–4	1–2 each
**Communications Receivers	1–2	1–2 each
Fuel Indicator	1	0.40
Instrument Lights (overhead)	2	0.60
Engine Indicator	1	0.30
Compass Light	1	0.20
Landing Gear Indicator	1	0.17
Flap Indicator	1	0.17
B. *Intermittent Load*		
Starter	1	100.00
Landing Lights	2	17.80
Heater Blower Motor	1	14.00
Flap Motor	1	13.00
Landing Gear Motor	1	10.00
Cigarette Lighter	1	7.50
Transceiver (keyed)	1	5–7
Fuel Boost Pump	1	2.00
Cowl Flap Motor	1	1.00
Stall Warning Horn	1	1.50

**Amperage for radios varies with equipment. In general, the more recent the model, the less amperage required.
NOTE: Panel and indicator lights usually draw less than one amp.

In some IFR conditions the initial overriding electrical need might be for power to maintain radio communications and navigation systems. In order to inform air traffic control of the emergency, virtually all other electrical loads should be shut down, at least momentarily, while attempting radio contact. This might include navigation lights and all panel and cockpit lights, cabin and pitot tube heaters, etc. Even if you are unable to get your call through it may be advisable to leave the receivers on, since much less power is needed to receive than to transmit, and a message for you may be relayed via an ATC facility or NAVAID, or even via another aircraft.

IFR Radio Failure

You should of course be thoroughly familiar with the procedures outlined in the Airman's Information Manual for IFR radio failure en route (FAR Section 91.127). This includes the provision that "... if the failure occurs in VFR conditions, or if VFR conditions are encountered after the failure, the pilot shall continue the flight under VFR and land as soon as practicable." (This procedure also applies when operating in a TCA or other positive control airspace.)

Note that "... land as soon as practical" is not synonymous with "as soon as possible." The pilot retains the prerogative of exercising his best judgement and is not required to land at an unauthorized airport, at an airport unsuitable for the type of aircraft flown, or to land only minutes short of his destination.

If the alternator failure occurs while you are flying a single engine land plane over a sizable body of water, accurate navigation becomes critical; you may not have fuel to spare for wandering off course. In order to conserve your battery power for VOR navigation you might elect to fly for suitable intervals on the magnetic compass, with the master switch off, turning it on periodically to reset your course, scan the panel and listen on the radio (if possible ATC should be notified of your intentions, so that they will continue to transmit to your call signal. Remember that you may be able to hear ATC when they cannot hear you.)

Since there is no way of measuring the amount of current left in the battery after loss of alternator power it is better to conserve it all for the purpose at hand—reaching shore and landing safely. Many pilots, after nursing a battery-weak aircraft to the edge of an airport, manage to culminate the flight with a crash landing because they are unfamiliar with the emergency procedure for putting the retractable gear down; they do it improperly or squander the remaining battery energy on the gear motor because they forget to turn it off.

In a recent accident at Pompano Beach the pilot of a Cessna 172RG returned to the airport safely after an alternator failure en route, with enough battery power left to contact the tower by radio. He then attempted to lower the landing gear with electrical power (about 10 amps) and apparently lost his radios in the process. Not perceiving the customary light indicating gear down and locked, he flew over the tower and requested by radio that they inform him if there was any problem with his landing gear extension. Not receiving a reply, the pilot assumed everything was all right and proceeded to land—whereupon the gear collapsed.

Every pilot should have some practice experience in lowering by hand the gear of the aircraft he/she flies. Going over the checklist for manually extending the gear and getting at the equipment is a task that is made much more difficult by the absence of light. Given the high cost of aircraft repairs, not to mention human rehabilitation, it would seem worth while to buy a first rate, weatherproof survival flashlight and keep it in the aircraft or in your flight kit. A companion item would be the type of small flashlight that clips to your shirt pocket, with a right-angled beam that can be directed by body movement alone. You never know when you are going to have your hands full with an airplane. ■

Can Human Error be Eradicated?

We all know that human error is a major cause factor in the great majority of aircraft accidents, particularly in general aviation. And most of us believe that more emphasis on education and recurrent training is a better means of reducing the toll from error induced accidents than heavy-handed rulemaking which restricts access to the national airspace. But is "Practice! Practice! Practice!" the whole story as regards the reduction of errors?

Some people do not think so. Dr. Carlton E. Melton, a human factors consultant to FAA, in his recent essay on "Human Errors in Aviation" points out that a great many accidents ascribed to pilot error do not involve inadvertent mistakes but intentional risk-taking. "No amount of training in flight maneuvers and procedures," he writes, "will cause an immature individual to make a mature decision. Anyone who deliberately flies into known severe weather does so not because of ignorance but because of a personal defect. Supplied with the same data some people will make good decisions and some will make bad ones."

What does he mean by a "personal defect"? Any personality trait or combination of traits that impels a pilot to take risks when there is no palpable cause for such a show of bravery. Such traits are dangerous because they can overrule the basic instinct for survival.

The admission that a piece of risky flying was carried out "in spite of my better judgement" is a common acknowledgement that judgement alone is not the only element that plays a part in decision making. Another important element is the desire to conform to a role model which is socially applauded. Dr. Melton points out that in aviation there is a long tradition of viewing pilots as courageous, death-defying individuals, whose heroic stature was measured by the degree of known risk they were willing to take in the air.

"Top Guns"

In the early days of aviation this emphasis on courage was probably inevitable, since so much of the theory and technique of flying was unknown or misunderstood, and *had* to be learned by trial and error. Even so, many of the best known pioneers, like Orville and Wilbur Wright, never played up the bravado aspect of flying. They concentrated on designing and building airplanes that were reasonably safe and manageable and could be sold for a profit. They died in bed, from ailments in no way related to flight.

The image of the pilot as a solitary, courageous warrior emerged from the role of aviation in World War I. This tradition, in one form or another, continued through the 1920's in the era of record setting and barnstorming, and in the speed racing decade of the 1930's. When the pilot as hero was not fighting the Boche he, and occasionally she, was engaging in mortal combat with the wind, clouds, storms, oceans, ice, mountains and all the primordial forces of nature—not to mention the limitations of human endurance. These struggles have been heavily romanticized in the Press and in fiction and film, and even today the hero of the crowd is the "Top Gun" of the sky, not the range.

That tradition is out of place in the contemporary world of civil aviation. Even in military flying the emphasis is on attention to detail, skill, precision and the avoidance of unnecessary risk. The Naval aviator hero is the pilot who makes 500 aircraft carrier landings without incident. The stature of a commercial pilot is measured not only by the skill with which he handles a half million pound airplane but also by his avoidance of any flight situation which might place his aircraft unnecessarily at risk. In general aviation today the best pilots are usually those you never hear about. They know that the essence of safety in flight is attending to a multitude of detail appropriately and in proper sequence, and in taking no unnecessary chances. Their reward is satisfaction, rather than excitement or adulation.

But some pilots still seek to conform to the old heroic tradition. They buzz beaches, fly under bridges, penetrate storms, scud run through mountain passes and fly unannounced through terminal control areas. They do not feel satisfied unless their margin of safety has been shaved by deliberate risk taking.

The latter type of pilot behavior is likely to continue as long as it evokes some measure of admiration or approval from society. It may not respond appreciably to recurrent training or to regulatory restrictions. Certainly it is not in the interests of general aviation pilots to support this tradition.

With regard to inadvertent errors, the precipitating element may be lack of currency or experience, or training; but it may also be due to the inherent capacity of human beings to make unintentional errors. This in fact may be one important way in which we are able to expand our knowledge and our conceptual thinking.

Errors of the Brain

Dr. Melton says that the human brain is organized in much the same way as a large corporation—it is hierarchical in nature. "Higher level, conscious brain function is similar to top management; it cannot be bothered with small details, so it merely sets policy or declares intentions. Execution of this declared policy is turned over to lower, subconscious echelons. Sometimes the intention is not clearly stated and sometimes communication between different areas of the brain is faulty, resulting in a variety of erroneous acts."

In another sense the brain could be likened to an autopilot, which does not actually prevent errors of intention but corrects them swiftly and smoothly, so that the goal or course is achieved reasonably well, even if the track is not altogether straight and level.

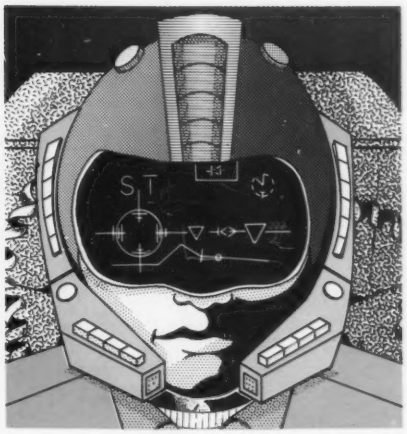
The view of our brain as an error-committing, error-observing and error-correcting organism is supported by studies that have been made of cockpit crews in flight. On commercial air carriers as many as a dozen or more errors per hour have been noted during routine procedures. These errors were all identified and corrected by the crewmembers without any "harmful" effect, and other persons in the aircraft and on the ground were oblivious to them.

How is it then that on some occasions errors are detected by pilots and sometimes they are not? Perhaps on some occasions the *rate* of error making is so high that it is not possible to track all of them down. Dr. Melton suggests that the rate of occurrence of externally observable errors may be influenced by modulators—factors that either increase or decrease the level of arousal of the brain—and thus, alertness. There is no question that drugs (including alcohol), workload, fatigue and stress are culprits frequently identified as causing errors—although under some conditions stress can cause us to become tuned into errors we might otherwise have missed.

Repetition Errors

Repetitive behavior is something to be concerned about. When we repeat some action or series of actions often enough it appears to sink down into a lower echelon of consciousness, freeing our conscious thoughts for other activity or for rest. But altering the repetitive procedure successfully may require conscious alertness.

For example, suppose a pilot is practicing touch-and-go landings at an airport for about an hour and finally decides to call it quits. He announces his intentions over the radio, flies around the pattern and lands. But suddenly he finds himself applying full power, reducing flaps, etc. and taking off—what happened? Repetition has an inertia-like effect on our activities. The motor forces guiding his hands and feet had been programmed, through repetition, to carry



out a given sequence of acts consequent to touching down on the runway. A fairly high level of conscious alertness was required to overcome this programming.

Sequential Errors

Another kind of situation which seems to be productive of errors is the interruption of a fixed sequence of activities, such as going through a checklist—particularly when you are airborne and must be attentive to many other matters at the same time.

A checklist is a deceptively simple-appearing means of assuring that an approved procedure has been followed—so simple that we sometimes have trouble maintaining an alert attitude toward overly familiar items. Our inclination is to go through the list as quickly as possible and be done with it. If we are interrupted while reading off a given item—say "Fuel pump on"—by a radio call, or a question from another occupant, or the need to adjust controls, etc., it is quite possible that when we return to the list we will move on to the next item without actually ascertaining that the pump *is* actually on.

CHARLES LINDBERGH

One way of reducing the likelihood of error here is to form the habit of "back-pedalling" a couple of items up the list, whenever you are interrupted while responding to a checklist.

Luck and Consequences

What may be most significant about pilot thinking and functioning, according to Dr. Melton, may be not how many errors we make or how often but whether their consequences are negative (harmful) or positive (non-harmful). Entirely safe flights have been accomplished in spite of gross errors committed before and during the flight. On the other hand, air disasters have occurred in consequence of a seemingly small error.

Consider the crash of a DC-10 wide-body jet while taking off from the airport at Paris, France on March 3, 1974. Failure to close a cargo door effectively led to structural failures, an uncontrolled crash and loss of 346 lives. Consider, by contrast, Charles Lindbergh's epic solo trans-Atlantic flight in 1927, which catapulted him from obscurity into the ranks of aviation immortals. As Dr. Melton points out, by his own admission Lindbergh did not sleep at all the night before the flight (which was to last 33 hours). He took off in a heavily loaded airplane with no forward vision (a "flying fire bomb", as some newspapers described it, in reference to the more than 400 gallons of gasoline on board the small, single-engine airplane). The pilot became lost over the Atlantic, flew into icing conditions and experienced extreme fatigue. Any one of these conditions could have resulted in just one more fatal effort to conquer the ocean.

But instead Lindbergh landed safely at Paris and was acclaimed a hero. People spoke only of the positive aspects of his flight—his courage, his endurance, his skill, and so on. As long as the end result was "positive" the errors were forgotten. "Lucky Lindy" the newspapers called him, and the sobriquet might have been more truthful than many people realized.

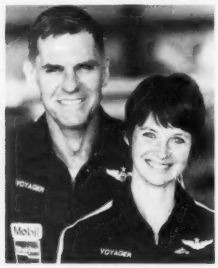
Luck—meaning circumstances or events over which we have no control—may play a larger role in flight safety than we like to imagine. When accidents happen and an investigation takes place we pinpoint the discernible errors and formulate a "probable cause"—but we are never totally sure about this, because our knowledge of all pertinent events is limited. Perhaps good luck is as much a consequence of responding effectively to error as it is of avoiding errors.

This idea should caution us against overconfidence. Experience is a great teacher, but offers no guarantees about the future. Just because we may have flown hundreds or even thousands of hours without ever even coming close to bending metal does not mean that the very next flight may not be more difficult than anything we could imagine.

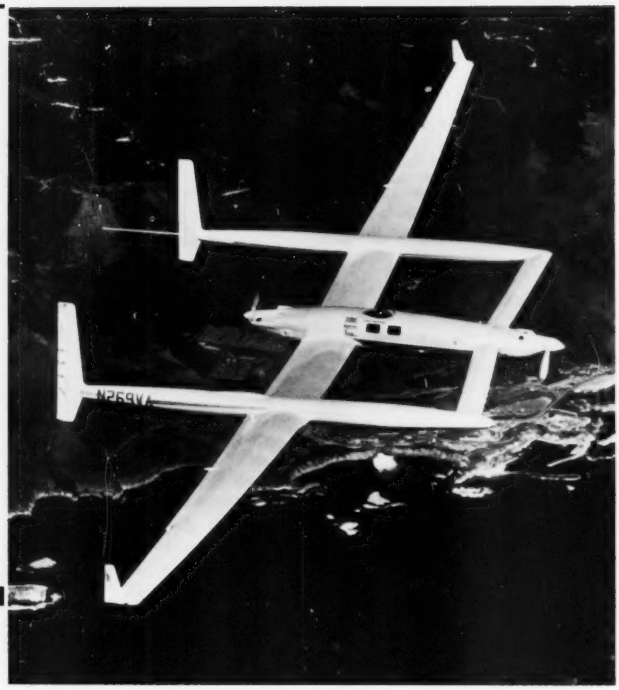
Flying gets better but it never gets easy. ■

Triumph of the Voyager

FIRST NON-REFUELED NONSTOP GLOBAL CIRCUIT



DICK RUTAN AND JEANNA YEAGER



In case you have been in hibernation and have not heard, the first nonstop, nonrefueled around the world flight was successfully accomplished last December. You will no doubt remember the banner headlined news coverage detailing the *Voyager*'s struggles against weather and mechanical emergencies. But what you probably did not hear much about are the physical and mental factors that had to be dealt with by the two pilots before and during the flight.

The team of Yeager and Rutan began at an airshow in Chino, CA. Dick Rutan, a big, brawny retired Air Force pilot, had just finished performing aerobatics, when a neophyte pilot asked questions about an aircraft she had fallen in love with. Slender, diminutive Jeanna Yeager was an experienced drafting artist who had just been laid off her aerospace job. As Rutan worked for his brother Burt's aircraft company, Rutan Aircraft Factory in Mojave, CA, he offered to find work for her. Under Dick Rutan's tutelage, Yeager was soon flying Rutan aircraft at record setting speeds. She even broke one of Dick's speed records—without breaking up their friendship.

In 1981 the two pilots posed a question to Burt Rutan during a coffee break: was it possible to design an airplane capable of a nonstop, nonrefueled, round-the-world flight? Intrigued, Burt sketched on a paper napkin an idea that would eventually become the *Voyager*. According to Burt's calculations, such a flight might just be possible if the airplane was constructed principally of the new lightweight carbon fiber composite materials now available. He was hooked on the idea of going after the last big aviation record on earth. All it would take was time—and money. Five years and several hundred thousand dollars.

As the project was not backed by Government or corporate funds, the donations of individuals had to be solicited, dollar by dollar and day by day. Starting out as a staff of two and with $10,000, Yeager and Rutan went on a nationwide publicity tour to sell their idea to what was at first a skeptical, indifferent public. At the same time they were busy also arranging the hundreds of administrative details the project entailed. The going was slow, so in late 1982 Burt offered to finance the construction if Dick and what volunteers they could recruit would do most of the work. Burt was also able to talk his suppliers into donating most of the materials and parts. By June 1984 the full scale *Voyager* was wheeled out of the hangar. Now the public showed more interest in participating in the record attempt. The end result was an aircraft with 110.8′ wing span, 17 fuel tanks, and an unpressurized cabin about the size of a phonebooth, just 7.5′ × 2′ (all the room that could be spared once necessary fuel space and engine weights were calculated). For the nine days of estimated flight time the two pilots would have to remain closeted in this semi-horizontal capsule.

While getting together a large technical support organization, Rutan and Yeager were also studying and gathering environmental information related to the unprecedent conditions of confinement they would have to endure. Their only movement would be changing places from the pilot seat to the narrow bunk space—which for Dick extended to the instrument panel.

Fortunately, both Rutan and Yeager were already in excellent physical condition from daily jogging and careful diets. Their medical team of volunteers attempted to anticipate any physical ailments which could possibly develop during the flight as a result of their immobility. Their care package included a daily dosage of fiber pills, vitamins, and baby aspirin (to keep their blood going) to sustain their health while in the air. But there was little they could offer for mental and emotional stability.

The top item of their daily checklist was conditioning their biological clocks so that one of the pilots would be awake at all times. In theory Rutan and Yeager would trade places every six hours. In reality, Rutan stayed in the pilot's seat 85% of the flight, as turbulence often made the tight-quarters exchange almost impossible with the snakelike movements necessary to accomplish it. Also there had been no opportunity for Yeager to be checked out in rough air handling of the *Voyager*.

By the time the flight ended, it was estimated that each had averaged only two hours of sleep daily. Dick Rutan admits to only one incident where fatigue and stress finally caught up with him. He had just flown over Central Africa and its severe turbulence, a wearisome experience after enduring typhoon Marge over the Pacific and a string of mechanical emergencies flying over the Pacific and the Indian Ocean. Dick was sitting in the pilot's seat when he "slipped into a state where you just don't care and you can't do anything. You don't know *how* to do anything ..." He somehow screamed for Yeager to help him; after some maneuvering they managed to exchange places so he could lie down and go to sleep. He was fine when he awoke and never had a re-occurrence.

Their preparatory training for the ordeal had consisted of progressively longer flights, to become accustomed to the aircraft's

handling characteristics and so that they could remain mentally alert while physically constrained for long periods. Some physicians predicted that the long confinement of the flight would render the pilots unable to walk for as long as 48 hours after touchdown. However, both pilots managed to walk after the flight.

A new worry cropped up on a four day practice flight—dehydration. Yeager fainted after the landing, just as they were getting ready for a press conference. It seems that Yeager made sure Rutan drank liquids during the flight, but the same favor was not returned. Both found that the sense of hunger or thirst was greatly diminished during the prolonged period in the air. To make sure the same thing did not happen again during the world flight, a daily liquid intake schedule was included on the checklist and closely followed. However, the liquids were considered more important than food, so only 10% of the food on board was consumed.

Continuous exposure to engine noise was another environmental unknown, but obviously a source of stress and a possible cause of hearing loss. During the last test flights Continental replaced the conventional air-cooled engines with an experimental liquid-cooled design that ran quieter and was more fuel efficient. Another piece of conventional equipment was replaced when the Bose Company loaned two special sound attenuation headsets, which did not interfere with wearing eye glasses or using oxygen tubes. Unlike the four day flight, the actual world circuit inflicted no discernible hearing loss.

The main concern of the medical team was the long range effects of human exposure to high altitude in the unpressurized cabin. Lab tests indicated that the smaller, lighter Yeager could function normally up to 3,000′ higher than Rutan, but the threat of hypoxia, while trying to avoid turbulence or severe weather, was too great to ignore.

On the other hand, the bulk and weight of standard oxygen equipment would be excessive for the amount of O_2 required. As part of the preflight research, physicians who had been involved in high climbing expeditions, such as Mt. Everest, were contacted and related literature was reviewed to learn more on the subject of how much oxygen would be required. The calculation had to be precise, since every excess ounce of cabin weight had to be excluded in order to assure takeoff capability with enough fuel for 25,000 miles.

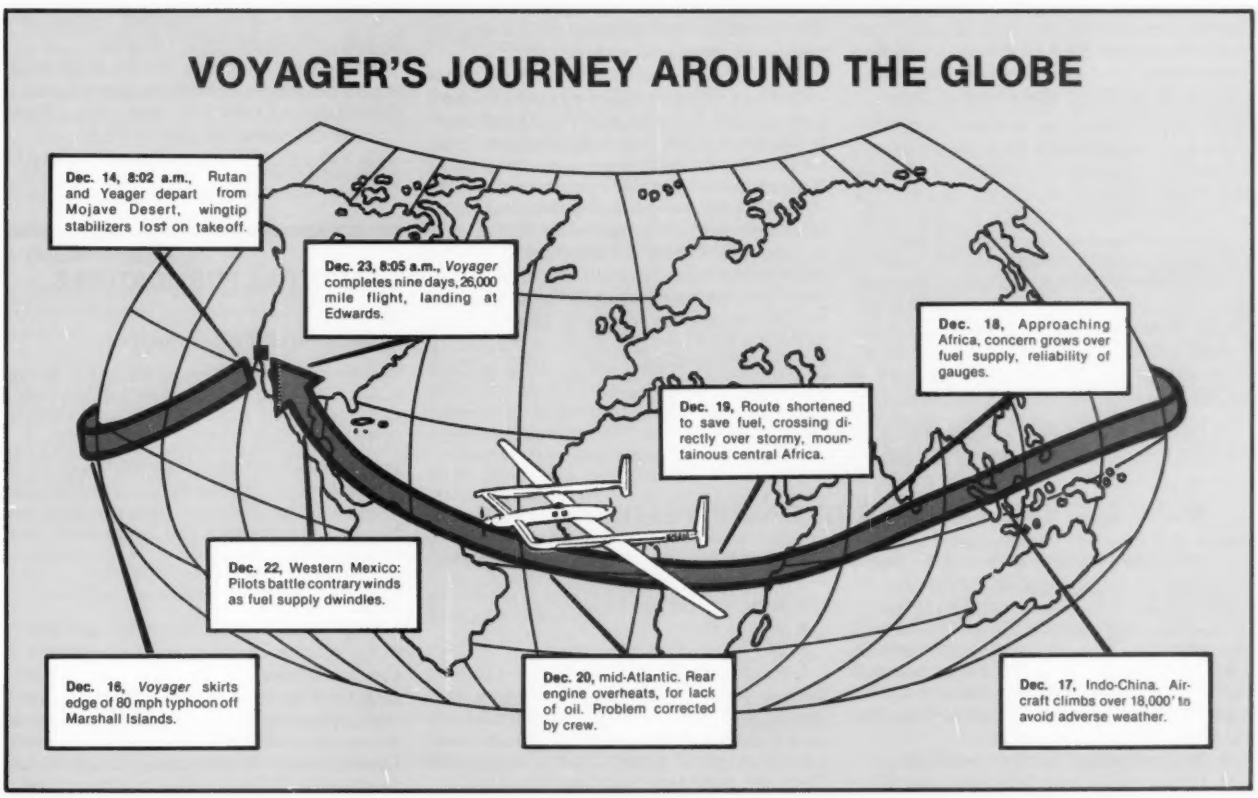
Dr. Sidney White of Los Angeles entered the picture when he volunteered his expertise in aviation oxygen equipment. White had worked with another doctor in the mid-1970's to adapt the cannula, or plastic tube, used in hospitals for individual nasal inhalation of oxygen, to aviation use. (It eventually gained FAA approval for use as an optional replacement for the oxygen mask up to 18,000′.)

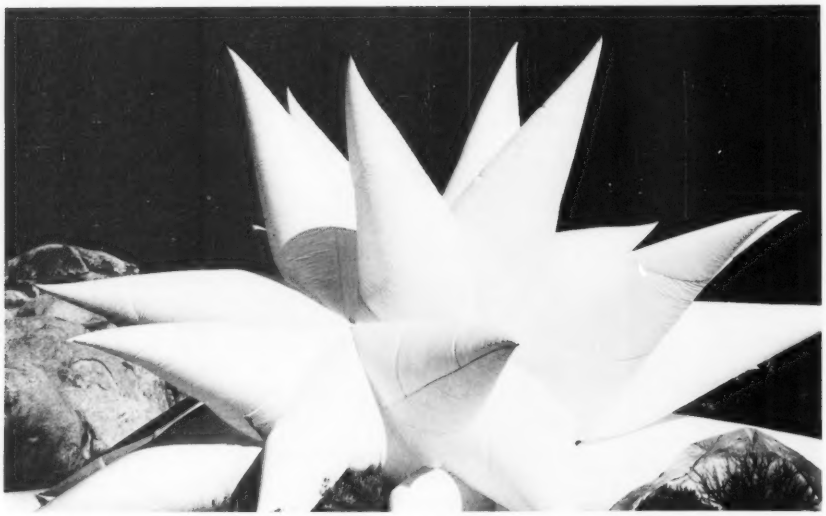
The cannula eliminates the need for cumbersome face masks that can interfere with radio communications if the pilot has to remove a mask for this purpose. Dr. White was also able to obtain for the project's use an ultralight oxygen cylinder not yet available for general aviation use, and incorporate a demand valve, which automatically permitted oxygen to flow only as the person inhaled. This system resulted in a 300% reduction in oxygen requirements for the flight as a whole. The last ounce of oxygen was consumed just prior to approaching the landing area. Given the stress induced by long confinement and the frequent need to fly above the weather while controlling an experimental aircraft, the availability of supplemental oxygen was considered a critical factor.

There were other factors that contributed to the success of the flight, perhaps the most important of which was Yeager and Rutan's mental altitude. Their willingness to endure the hundreds of discomforts and irritants that made up their nine days of near-immobility and still carry out their cockpit tasks effectively was a remarkable triumph. They knew that this was probably the last major flight record to be established on earth. They believed it could be done, and they wanted to justify the faith of all those willing to volunteer their time, money, and expertise to help make the dream come true.

For a few brief days, all of America shared that dream. ■

This article was researched and prepared by Edward Benington.


VOYAGER'S JOURNEY AROUND THE GLOBE
Dec. 14, 8:02 a.m., Rutan and Yeager depart from Mojave Desert, wingtip stabilizers lost on takeoff.
Dec. 23, 8:05 a.m., Voyager completes nine days, 26,000 mile flight, landing at Edwards.
Dec. 18, Approaching Africa, concern grows over fuel supply, reliability of gauges.
Dec. 19, Route shortened to save fuel, crossing directly over stormy, mountainous central Africa.
Dec. 22, Western Mexico: Pilots battle contrary winds as fuel supply dwindles.
Dec. 16, Voyager skirts edge of 80 mph typhoon off Marshall Islands.
Dec. 20, mid-Atlantic. Rear engine overheats, for lack of oil. Problem corrected by crew.
Dec. 17, Indo-China. Aircraft climbs over 18,000′ to avoid adverse weather.



NO BATTLE STAR. This strange object, which may be sighted in the Alaskan sky near Anchorage later this month, is not a hostile space ship but an "inflatable sculpture". Known as the Berlin Star and designed by Otto Piene of the Massachusetts Institute of Technology, it is technically a moored balloon with a diameter of about 50 feet, riding at an elevation of approximately 200 feet above the ground (lighted). The basic structure is spinnaker cloth; lift is provided by helium in plastic tubing. The fanciful creation has both scientific and esthetic value. It may be the forerunner of a future space vehicle.

LIMITED AIRCRAFT ACCESS TO GRAND CANYON NATIONAL PARK

Pilots planning to fly in the vicinity of Grand Canyon National Park should check with the nearest FAA flight service station concerning Special Federal Aviation Regulation SFAR 50–1, effective as of June 15, 1987.

Earlier this year the FAA established a temporary Special Flight Rules Area over the Grand Canyon National Park from the surface to 9,000 feet MSL (shown on the current Las Vegas section chart). Under this regulation, specific authorization was required prior to entering the area. Under the new rule, which eases access restrictions, flight within the area is limited to published routes and altitudes, unless otherwise authorized, or required for safety of flight.

In recent years the high volume of air traffic over the Park has increased the risk of midair collision, and also created noise conditions which may interfere with Federally mandated usage and maintenance.

The new rule also establishes boundaries of certain noise-sensitive areas of Grand Canyon Park to be avoided by aircraft overflight up to 9,000 feet MSL; and sets forth certain terrain avoidance and communications requirements for flights over the Park.

SFAR 50–1, which has a five year duration, is subject to changes as a result of public comments received within 120 days of its effective date. Additional information may be obtained by referring to Class II NOTAM's and the August 1, 1987, edition of FAA's Southwest U.S. Airport Facility Directory. The September 24, 1987, edition of the Las Vegas Sectional Chart will contain a more detailed depiction of the Special Flight Rules Area and the authorized flight routes.

MORE STATIONS CARRYING TELEVISED WEATHER REPORT

"A.M. Weather," a public television broadcast for pilots and others with vital interests in the weather, is now seen on over 275 public television stations throughout the country. The program originates in Maryland at 6:45 a.m. but is programmed at different times on the individual stations, varying from 5:45 to 8:45 a.m. Regular features of the broadcast include:

- National map of current weather
- 12, 24, 48, 72 hour forecasts
- Long range, temp. and precip. outlooks
- Snow cover information
- Icing reports and turbulence
- Winds aloft
- Severe weather advisories

For information on your nearest public television station carrying this program and the air time, write to A.M. Weather, Maryland Public Television, 11767 Bonita Avenue, Owings Mill, MD 21117, Telephone (301) 356-5600.

FAA TIGHTENS CONTROL OF INSTRUCTOR CERTIFICATES

As of April 1, 1987, FAA inspectors are resuming the conduct of practical tests for the original issuance of flight instructor certificates. No new designations of authority for the original issuance of flight instructor certificates will be given to civilian flight instructor examiners.

During the current phase-in period, which will terminate no later than March 31, 1988, persons who currently hold Flight Instructor Examiner (FIE) designations may continue to administer practical tests for the original issuance of flight instructor certificates and ratings. After this date FIE's may not accept applications for the original issuance of flight instructor certificates and ratings.

FIE certificates of authority which expire after April 1, 1987 will be rescinded. At the discretion of the examiners's FAA supervising district, these certificates may be reissued, but with authority only to conduct practical tests for the *renewal, reinstatement,* and/or *addition* of a rating to be added to a flight instructor's certificate.

Persons issued the new FIE designated authority will not be authorized to approve applications for the renewal or reinstatement of flight instructor certificates on any basis other than a satisfactory completion of the practical test, as prescribed in FAR Section 61.183 (e), 61.197, or 61.199.

This policy change is related to the findings of the general aviation safety audit conducted during 1984 and 1985, which highlighted the need for closer FAA contact with holders of flight instruction certificates.

LATEST FAA PUBLICATIONS

Disaster Airlift Responsibilities

A new advisory circular describes the responsibility of FAA and the Civil Air Patrol in state and regional disaster airlift (SARDA) plans. SARDA was developed to mobilize non-air carrier resources in times of emergency. AC 00-32A is free from the DOT, Utilization and Storage Section, M-443.2, Washington, DC 20590.

Type Ratings

Pilot schools, pilot examiners and others in the aviation industry will be interested in a new circular which shows the official FAA pilot certificate designations for all aircraft type ratings, including foreign aircraft. AC no. 61–89B, "Pilot Certificate: Aircraft Type Rating," is free from the above address.

• Second-in-Command

My question concerns the logging of second-in-command time by a safety pilot. FAR 91.21 (b) (1) requires that an appropriately rated safety pilot occupy the other front seat during simulated instrument flight. FAR 61.51 (c) (3) states that second-in-command time may be logged when the regulations under which the flight is conducted requires a second pilot. Does this mean that an appropriately rated safety pilot is allowed to log second-in-command time during simulated instrument flight in VFR conditions.

Robert A. Christler
Newark, NY

Affirmative. An appropriately rated pilot may log second-in-command time while acting as safety pilot during simulated instrument flight.

• Relocation

Good articles on homebuilts and the EAA in your May/June issue. Only I think you had better check on the address you gave for the EAA Headquarters. You might find that a few years out of date.

Vienna, VA

Right you are. The new address is EAA, Steve Wittman Airfield, Oshkosh, WI 54903–3065.

• Oceans & Motions

Your article on thunderstorms jogged my memory enough to call up the words of wisdom from some old (not bold) salty naval aviators. One old timer said (in illustrating weather related No-No's) "If you could see the air in motion, as you're able to see the ocean in motion, you'd probably be too darned scared to fly!"

At least thunderstorms are somewhat visible, and so one ought really to keep away!

The article you published is one of the best I've read on the subject (Avoiding Convectional Thunderstorms). I've read everything (almost) from "Bowditch" H.O.9 (1938 issue, my first book on the subject) all the way to various volumes in modern literature. But for clarity and even precision, your work tops all.

Irving Groupp
Venice, CA

The invisibility of turbulence certainly can be misleading. Visualizing an "ocean of motion" when you see the familiar thunderstorm formations might help keep pilots safely at a distance.

Many thanks for your sincere compliments.

• Baa, Baa Windshear

I find your publication very informative, with a good selection of articles. I was, however, rather amused with the following line—"In the area of shear the air is agitated and whirled about in all directions, visualized like the ragged twisted wool on the back of a newly shorn sheep." This was written in the box "Wind Shear and Turbulence," on page 8 of the April issue.

As a sheep producer and shearer, I really can't relate to your description of turbulent air. Newly shorn sheep are nearly naked, or if shorn for the winter (using a special sheering comb) they have a short, uniform layer of wool. Maybe shearing is done different where your writers live. Besides, how many of your readers have ever seen a newly shorn sheep anyway?

Stella A. Briggs
Ledyard, CT

We bow to your expertise. Probably the phrase was picked up at a time when shearing was less mechanical and professional. At any rate we will be on the lookout for a new term.

• Qualified But Not Current

A further clarification of the "Safety Pilot Qualifications" letter from Michael J. Halliday of Westchester, New York is requested.

Your response stated simply that "the safety pilot must have a current medical certificate." Does that mean that a fully qualified pilot, conducting practice instrument approaches under a hood under VFR in a multi-engine aircraft, could legitimately utilize a single-engine pilot with a current medical certificate as a safety pilot, if at no time that single-engine pilot were to act as pilot-in-command?

Jan David Jubon
Atco, NJ

A safety pilot is a required crewmember for a certain type of flight, and as such must be appropriately rated and qualified for the aircraft, as well as in possession of a valid medical certificate. Thus, in the example you cited, a single-engine pilot may not act as safety pilot since he/she does not hold a multi-engine class rating.

• No "Curtis" Travel-Air

I was favorably impressed with your article in the March/April issue concerning convectional thunderstorm avoidance. Having avoided quite a few of these nasties myself by use of the eyeball method, I found it intriguing to learn just what radar can't do.

However, regarding the antique aircraft article on the news page, as I remember the Travel-Air 4000 (which I flew) it was not a Curtiss-built plane. There was a series of Curtiss-Wright Travel Airs (12W, 16E. etc.) but these were different airplanes built later by a different company, if memory serves. I am now in my sixth decade in aviation and still active as a CFII at the Frankfort IL airport.

Charles M. Hayes
OX5 Club #471

Nothing wrong with your memory. It was the Curtiss-Wright company, not Glenn Curtiss, that built the original *Travel Airs*, according to the U.S. Census of Civil Aircraft (1985). And thank you also for the spelling corrections.

FAA AVIATION NEWS welcomes comments from our readers. No anonymous letters will be used, but names will be withheld on request. Address: FAA AVIATION NEWS, AFS-810, Washington, D.C. 20591.

• Whose Ceiling?

At Ketchikan (International) Airport in Alaska you have a control zone and an FSS but no tower. Those of us who operate out of the seaplane base in the southeast quadrant of the control zone are required by the FSS to get a Special VFR clearance whenever they observe a ceiling of less than 1,000 feet, regardless of how high the ceiling is at our base.

This seems contradictory. In your article on the XYZ's of CZ's (Jan/Feb 1985), your Scenario IV says that a pilot may determine the weather for himself when landing or departing from an airport where there is no control tower or official weather observer.

Who is wrong?

Name withheld.
Ketchikan, AL

The Ketchikan FSS procedures, as you describe them, are essentially correct. Our Scenario IV was incomplete in that it should have indicated that the ceiling may be determined independently by pilots at a satellite airport in a control zone only when there is no official weather being reported in the zone.

The article has been revised and is available as a reprint from FAA District Offices.

• Weather Symbology

I request your help in interpreting some weather symbols that are puzzling me. For example, in regard to the hourly sequence reports, what do the letters SA stand for? Some FAA sources say it means "scheduled airways," or "scheduled aviation," or "surface aviation." Which, if any, is correct?

Also, what is the connection of the letters UA to pilot reports; FD to wind aloft; and GF in the IVR system?

Newton W. Miller
Redlands, CA

Letter symbols used in weather information do not always stand as an abbreviation for something other than a code. SA in the sequence reports mean a "scheduled record observation" (made at a Weather Service Station). In weather language UA means a PIREP or pilot report (UUA for urgent PIREP). FD concerns winds and temperature aloft forecasts. GF in the IVR system means winds aloft forecasts (grid format).

Some FAA publications may contain outdated meanings for these symbols, and these are being corrected. For practical flying purposes most or all of the symbology information you might need is contained on the handy yellow card called "Key To Aviation Weather Observations/Forecasts," which will soon be available from your local APS.

We plan to publish an article on this subject in the near future.

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A regular program of recurrent training is one of the hallmarks of every serious, safe pilot. Every six months, airline pilots who fly consistently travel to a professionally-staffed education center for recurrent training.

The typical general aviation pilot who flies much less frequently than the airline pilot may have refresher training as infrequently as every two years, during the biennial flight review, which is required by Federal Aviation Regulation Part 61.57. Is this enough to insure that you are a safe, proficient pilot?

In 1977, the FAA's Accident Prevention Program introduced the "Pilot Proficiency Award Program" to encourage pilots at all levels to voluntarily participate in regular recurrent training. For each year of participation in the program FAA will award the pilot with a distinctive wings pin and an award certificate. There are now six phases of wings, each signifying the recipients' continuing commitments to safety and excellence as a pilot.

The "Pilot Proficiency Award Program" consists of two parts: attendance at an FAA sponsored aviation safety seminar, and three hours of specific flight training with a certificated flight instructor. In order to qualify for an award, the training must be

completed within one year. Twelve months after the date of meeting the final requirements for one phase of award, a pilot may complete requirements for the next level of award. The specific requirements for flight training depend on the category of aircraft used. For airplanes the requirements are:

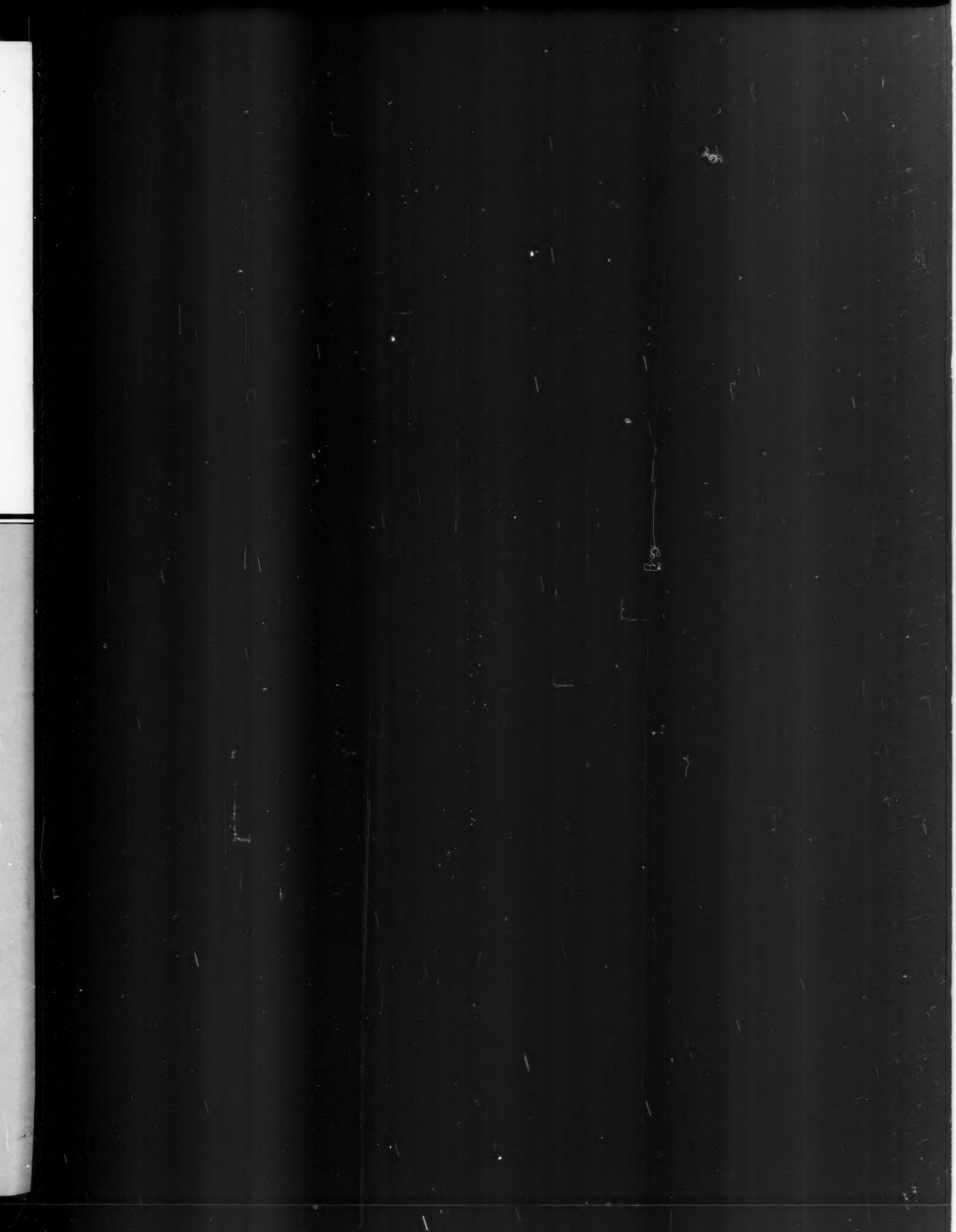
1. One hour of training to include basic aircraft control, stalls, turns, and other maneuvers directed to mastery of the airplane.
2. One hour of training to include take-offs and landings, including crosswind, soft field and short field techniques.
3. One hour of instrument training.

This flight training can be given by any current, FAA-certificated flight instructor (CFI). If your CFI is not familiar with the "Pilot Proficiency Program," please obtain a copy of FAA Advisory Circular 61–91E. This Advisory Circular also details the flight training requirements for helicopters, gliders, and balloons.

More information and specifics of the program may be obtained by contacting your local Accident Prevention Specialist at the nearest FAA General Aviation District Office (GADO) or Flight Standards District Office (FSDO). You may also contact the Accident Prevention Program Branch, AFS–810, 800 Independence Avenue, SW, Washington, DC 20591.

Note that some insurance companies are now recognizing the value of the "Pilot Proficiency Award Program" in reducing pilot error as an accident cause factor, and may offer favorable consideration to those who complete the training.

Remember, some pilots find it difficult to believe that human learning, once acquired, is not stored permanently in the mind—as is possible with computers. But the fact is that human intelligence retention is selective: we retain both skills and knowledge in proportion to their use and apparent importance to our survival.

The process of forgetting can begin almost the moment we walk off the airfield with a newly acquired certificate or rating in hand.

If your pilot competence is not supported by a mandatory recurrency training program, you are a prime candidate to participate in the "Pilot Proficiency Award Program" and *Earn Your Wings!* ■